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THE FORM OF THE CURVE OF PRACTICE IN THE CASE OF ADDITION

By EDWARD L. THORNDIKE, Teachers College, Columbia University

Each of 670 college students added daily for seven days forty-eight examples like those printed below, using seven printed sheets differing in the examples, but equal in average difficulty.

7	4	9	2	3	7	2	7
8	2	3	9	7	4	6	5
6	3	6	6	8	8	3	2
5	2	6	3	5	3	8	7
6	9	5	7	3	3	3	5
5	5	8	2	2	7	9	8
3	8	4	9	8	5	9	6
5	7	8	6	3	7	5	4
7	5	3	3	9	8	2	8
7	5	2	8	8	5	5	3

Each individual kept score of the time required and of the errors made. The scores for time required were kept with ordinary watches and are probably not very exact and are probably occasionally afflicted with large errors (of a minute or more).

I show in Fig. 1 the practice curves for the 336 columns, for the average of the 7 who were initially slowest, the average of the 13 next slowest, the average of the 29 next slowest, and so on, with groups numbering 36, 42, 61, 64, 45, 42, 73, 45, 41, 56, 52, 22, 22 and 21. These practice curves with two exceptions show the straight slope found by the author in a similar experiment with 19 adult students. (The two exceptions are the curve for the two most rapid groups. In the most rapid group there is a falling off with practice.[1])

[1] The measurements which this curve represents are for special reasons much less reliable than those for the initially slower groups; and its eccentricities should not be taken too seriously.

In the next most rapid there is zero improvement at first and then a very rapid rise. The results are thus notably different from the average curve found by Wells with hospital attendants, and from that found by the author with children in the fourth grade. In these two latter cases the curve rises rapidly at first and then more and more slowly.

I am inclined to explain the difference between the straight slope characteristic of college and graduate students, and the parabolic form characteristic of hospital employees and young

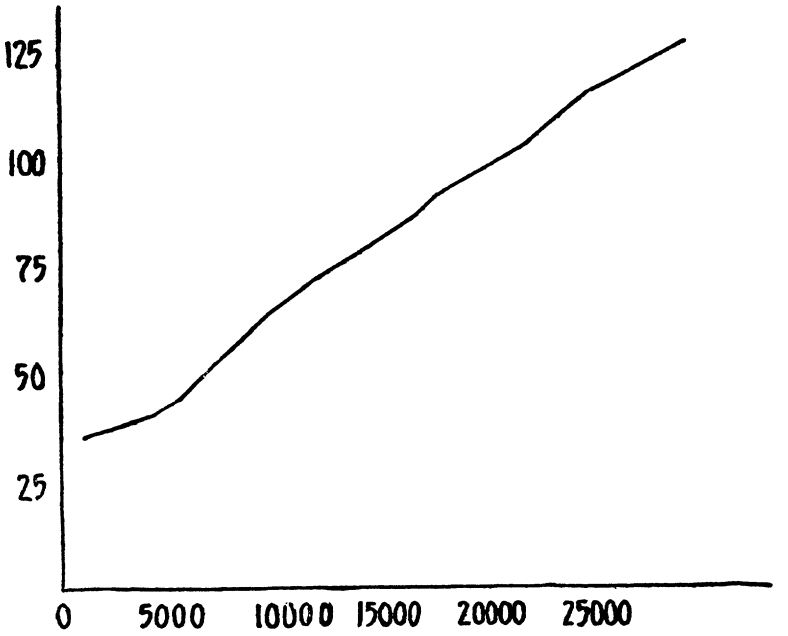

FIG. I.

school children as a result of differences in interest. This, however, is speculative. What is empirically shown is that the difference is *not* due to the fact that the college and graduate-student groups begin their practice at a much higher level. For the lower groups of these 670 students began at a lower ability than Wells' ten subjects; and, further, within the group there is no tendency for the initially lowest to show either a more rapid initial rise or greater negative acceleration than the initially higher group. If we should make a composite practice curve for improvement from 34 additions per 100 seconds to 150 additions per 100 seconds,

by taking the curve of the slowest group until it reached the height of the beginning of the next slowest group, then extending it by taking the curve of this next slowest group

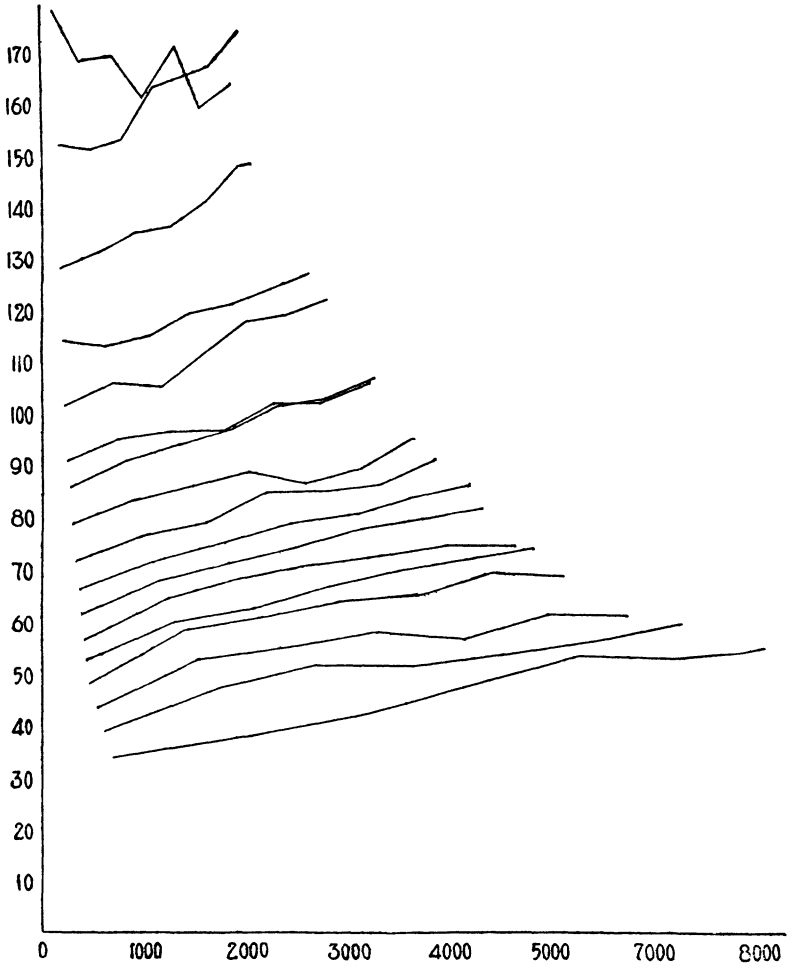

FIG. 2.

from its beginning until it reached the height of the beginning of the third group in order of slowness, and so on, the composite so obtained would not be at all of the parabolic

form. It would be very close to a straight line, as is shown in Fig. 2.

Description of Figures 1 and 2

Fig 1. Practice Curve in Single-Column Addition. Each curve represents the average of a number of individuals, the numbers being 7, 13, 29, 36, 42, 61, 64, 45, 42, 73, 45, 41, 56, 52, 22, 22 and 21 in order, beginning with the lowest curve. Distances along the base-line represent amounts of time devoted to practice. The vertical heights of the curve represent the number of additions per minute (writing the sum being counted as one addition).

Fig 2. Composite of All save the Two Highest Curves of Fig. 1. The lowest curve is taken from its beginning until it reaches the height of the beginning of the next lowest curve; then this next lowest curve is taken until it reaches the height of the second from the lowest curve; and so on.